

Professional Series
Technical Manual
Model 5306
Mixer/Preamplifier



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Professional Division Warranty

Every JBL Professional Series electronic product is guaranteed against defects in material and workmanship for a period of two years. JBL will replace defective parts and make necessary repairs if our examination reveals evidence of faulty workmanship or material. The warranty does not cover damage caused by misuse, accident or neglect. JBL retains the exclusive right to make such determination on the basis of factory inspection.

If it is impractical to return the product to the factory, please write to JBL describing the difficulty or malfunction. JBL may, at its option, establish alternative repair procedures or furnish replacement parts as appropriate.

Products returned to the factory must be shipped prepaid. The warranty on JBL products shall remain valid only if repairs are performed by JBL or under its authorized procedures, and provided the serial number on the unit has not been defaced or removed.

Specifications*

Maximum Gain	
Microphone	86 dB, ± 2 dB
Program	40 dB, ± 2 dB
Output Level	+24 dBm maximum
Frequency Response	20-20,000 Hz, ± 1.0 dB
Total Harmonic Distortion	
Microphone and Program	Less than 0.2% at +18 dBm, 30-20,000 Hz (test channel gain at maximum, Master Gain at 7)
Intermodulation Distortion	Less than 0.2% at +18 dBm (SMPTE Standard)
Noise	-125 dB equivalent input noise noise floor -55 dBm
Input Overloading	
Microphone	-2 dB
Program	+40 dB
Microphone Channel Isolation	80 dB min, 20-20,000 Hz
Input Impedance	
Microphone	2800 Ω (matches 150 Ω mike input)
Program	24,400 ohms unbalanced, (prog. control set for max.)
Output Impedance	Approximately 100 ohms all outputs
Controls	
Program (2 channels)	Audio taper, range
Microphone (6 channels - expandable to 14; with 5308 Expander)	Modified audio taper
Master Gain	Audio taper
Monitor Gain	Audio taper
Low Frequency Equalization	± 15 dB (3 dB/step) at 20 Hz, shelving
High Frequency Equalization	± 15 dB (3 dB/step) at 20 kHz, shelving
Power	On-off toggle switch
Indicators	Lighted VU meter Microphone channel overload flashers
Monitors	Headphone and unbalanced outputs, paralleled on front and rear panels
Monitor Output	+24 dBm maximum
Power Supply	120V AC, 50/60 Hz, 50 Watts, fused
Dimensions	5 $\frac{1}{2}$ " x 19" x 9" deep 13.3 cm x 48.3 cm x 22.9 cm deep
Mounting	3 EIA standard rack spaces
Panel Finish	Non-glare baked enamel, light gray
Net Weight	12 lbs 5.4 kg
Shipping Weight	18 lbs 8.2 kg
Warranty	Two years
Accessories	
5308	Expander, 8-channel
5192	Magnetic Phono/Tapehead Preamp, plug-in module
5196	Bridging Transformer, plug-in module

*Measured with microphone transformers in place and one channel and Master Gain at maximum, unless otherwise indicated.



JBL Model 5306 Mixer/Preamplifier

The JBL 5306 is a solid-state mixer/preamplifier capable of integrating two program channels and six microphone inputs. It features operator-oriented controls, exceptionally wide dynamic range, extended frequency response, low noise, and minimal intermodulation distortion.

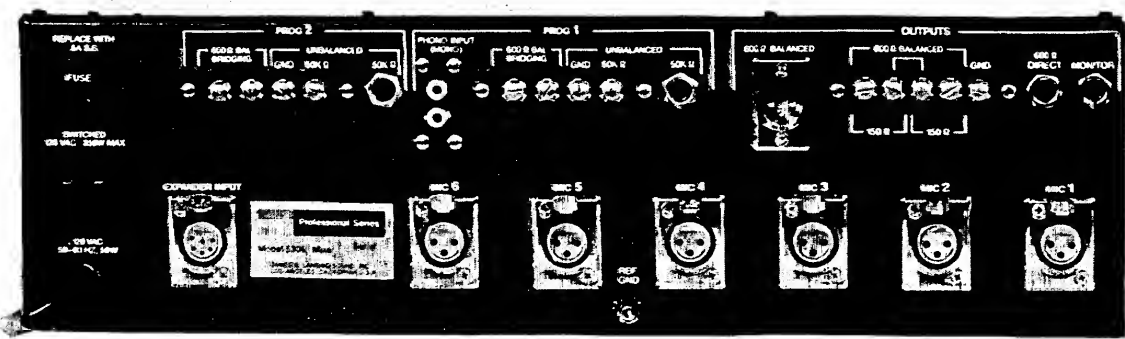
Each of the six microphone channels is equipped with an overdrive indicator that flashes when its preamplifier circuit begins to overload. In use, the indicator becomes operative before distortion reaches audible levels, providing ample warning to make the proper gain adjustment. The unusual dynamic range of the 5306 results from a preamplifier circuit whose operational characteristics are changed as the gain control is adjusted. Reducing the voltage gain of the circuit permits greater input without clipping the output signal. Since the Master Gain controls the mixing circuit in a similar manner, the 5306 is particularly well-equipped to handle extreme loudness variations.

Installation

Mounting

The 5306 can be rack-mounted in three EIA standard spaces without additional bracing or ventilation. All external connections are made on the rear panel where connectors are organized and labeled by function. The unit is ready to use as shipped; however, various modifications or additions, described elsewhere in this manual, may be desirable for specific applications.

Note: All low-level amplification circuitry can be adversely affected by strong magnetic fields. For this reason, it is recommended that the 5306 be located at least seven inches from any power amplifier or similar source of electromagnetic radiation.



Input Connections

Program—The program channels are wired for unbalanced 50,000-ohm operation and are equipped with both screw terminals and phone jacks on the rear panel. Either of the channels can be converted to 600-ohm bridging input by removing the jumper between pins 2 and 8 (marked by white dots) of the transformer socket which is located on the chassis, and inserting a JBL 5196 plug-in transformer. Access to the chassis can be gained by removing the top cover plate which is held in place by eight sheet metal screws.

Program 1 will accept the low level output of a magnetic phono cartridge if the jumper between socket pins 2 and 8 is removed and a model 5192 Phono Preamplifier Module is inserted in its place. The 5192 connects the phono jacks on the rear panel to the Program 1 preamplifier circuit. The two jacks, marked "Phono Input," are paralleled to combine the signals from a stereo cartridge; a monaural cartridge can be plugged into either of the jacks.

Microphone—The microphone channels are each transformer isolated and balanced for 50 to 600-ohm inputs. Input connections are made through female XLR connectors. Pin 1 of each connector is ground and pins 2 and 3 are the balanced input.

A high level input that would ordinarily be connected to the program channels may be fed to any of the microphone inputs if external loss pads are employed. Under these conditions, microphone channels so used cannot be driven beyond .5 volts RMS without excessive distortion.

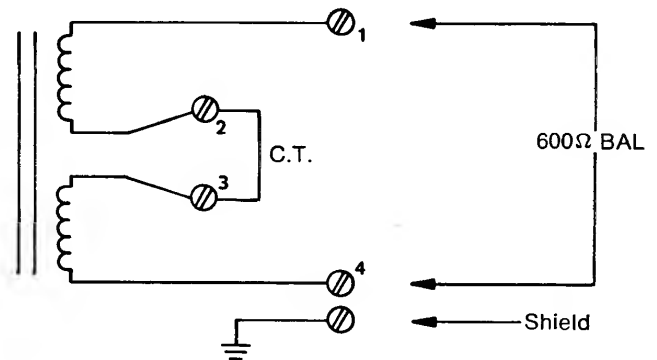
A high level, high impedance program source, such as a tuner or ceramic phono cartridge, may be connected to a microphone channel if the program channels are not available. To accomplish this, it is necessary to make a pin adaptor to replace the microphone input transformer. Connect a 1-microfarad capacitor across pins 5 and 9 and connect a jumper between pins 1 and 3 of the adaptor. With the adaptor in place, input impedance will be about 300,000 ohms, and pin 2 of the XLR connector will be connected to ground. The peak flasher will indicate when input voltage is too high. This modification will also allow use of a high impedance microphone.

Expander—A five pin XLR female connector, marked "Expander Input," supplies power to a JBL 5308 8-channel expander and receives the mixed signal from the expander. A "Y" adaptor can be fabricated to allow the use of two 5308's. The Expander Input must not be used to supply power to any other accessory.

Output Connections

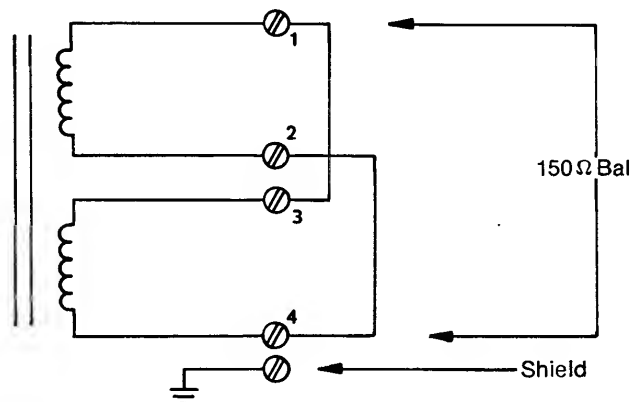
The output transformer has a split secondary winding to permit 600-ohm or dual 150/600-ohm connections.

Balanced—To achieve a 600-ohm balanced output, terminals 2 and 3 on the rear panel must be strapped. The output connection can be made at the male XLR connector pins 2 and 3 or at screw terminals 1 and 4 with the shield connection to pin 1 of the connector or at the terminal marked "GND."



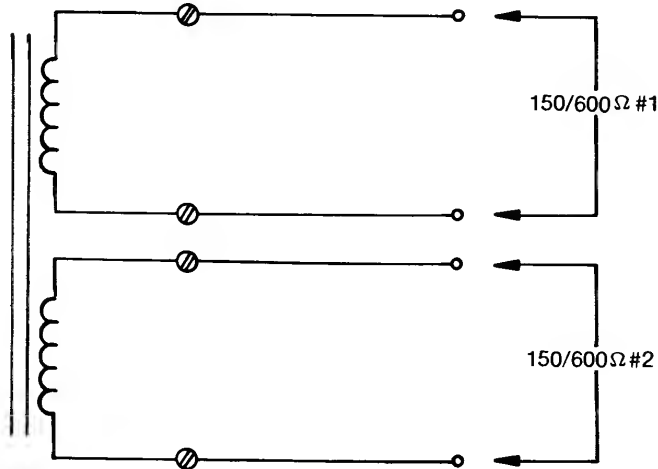
600-ohm Balanced Output

For 150-ohm output the transformer windings may be paralleled. Starting at the left of the terminal strip, strap terminals 1 and 3 and strap terminal 2 to terminal 4. The output connection can then be made at terminals 1 and 4.



150-ohm Balanced Output

The two 150-ohm windings may be used separately as two isolated 150-ohm outputs. Terminals 1 and 2, and 3 and 4 will each provide a 150/600-ohm output when the strapping is removed. When using dual outputs, the mixer output levels will each be reduced by approximately 6 dB. Additional amplification may be necessary to insure sufficient gain under these operating conditions.



Dual Balanced Outputs

Unbalanced—The transformer can be bypassed to achieve an unbalanced 600-ohm output at the phone jack marked "600Ω Direct." The jack can also be used to feed another bridging input when the balanced 600-ohm line is being used for other service.

Monitor—The output of the monitor amplifier is available on the front panel and the phone jack marked "Monitor" on the rear panel. The output signal is unbalanced and unequalized for use with a 600-ohm load.

Grounding

Input—Each microphone circuit is grounded to the chassis at the printed circuit board input. Any additional connection between the circuit and chassis or ground may cause hum.

Output—When the balanced output of the 5306 is connected to a power amplifier that does not have an isolation transformer, the circuit-to-chassis connection at the power amplifier must be removed. However, it is necessary to make sure that the two chassis remain electrically connected. If the chassis are mounted in the same rack cabinet or if both units have 3-wire power cords, this condition will be met. A binding post is provided for use in the event that no other ground connection exists. When the output transformer has been bypassed and the 5306 is used with a device that does not have an input transformer, the shield of the connecting cable must be grounded at both ends.

System Gain Adjustment

To insure that optimum signal-to-noise ratios are maintained when the 5306 is used with additional equipment between it and the power amplifier, the gain of the auxiliary devices must be adjusted so that the 5306 is allowed to run at normal

levels, i.e. 0 to +8 dBm. If any of these devices do not have input attenuators, then a fixed network must be constructed or a variable attenuator provided. Extra gain in these devices must be individually attenuated and the final system gain setting made at the power amplifier gain control. Care must be taken to insure that no component is being overdriven.

Operation

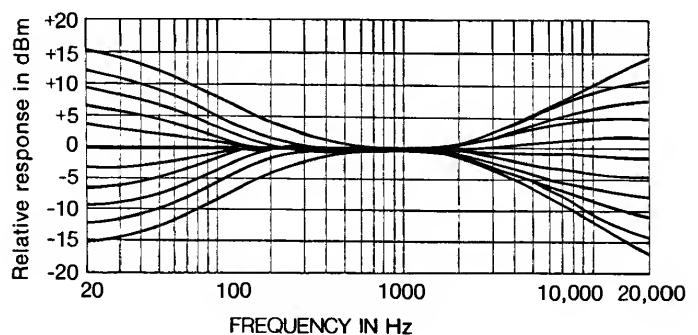
Master Gain—The Master Gain allows the operator to adjust the level of all inputs simultaneously. It is a feedback control that prevents overdriving of the mixer circuits and the internal amplification stages.

Mixing Controls—The program and microphone controls should be positioned at "5" for average input signal levels. The VU meter has been calibrated to indicate approximately 0 VU at a line level of +8 dBm; an access hole is provided on the top cover for readjustment. Amplifiers that follow the 5306 must have their attenuation controls properly set to keep from overdriving the system. It should be remembered that the 5306 is capable of producing +24 dBm before audible clipping.

The microphone channel overload indicators will operate when the signal peaks are 3 dB below clipping; the input level at which this occurs is dependent upon the setting of the channel gain control. As an approximation, at a setting of "2", a -2 dBm level will clip; while at the maximum setting, the clipping level will be -22 dBm. Therefore, loss pad insertion is usually not necessary to attenuate a high level input signal. The indicator circuit is designed to produce noticeable flasher activity before clipping occurs and before distortion reaches audible levels. This progressive warning function allows the operator ample time to make any necessary gain adjustments.

Equalizer Controls—The detented equalizer controls are marked in 3 dB steps of boost and cut at 20 Hz and 20 kHz to a maximum of ± 15 dB. They do not affect midrange program material, nor do they affect the monitor output.

Monitor Gain—Since the front and rear monitor outputs are paralleled, their levels are adjusted simultaneously by a single gain control. Monitor output is not affected by the Equalizer controls.



Equalization—The Equalizer controls affect output of the 5306 below 300 Hz and above 2000 Hz. Note that they do not affect midrange program material.

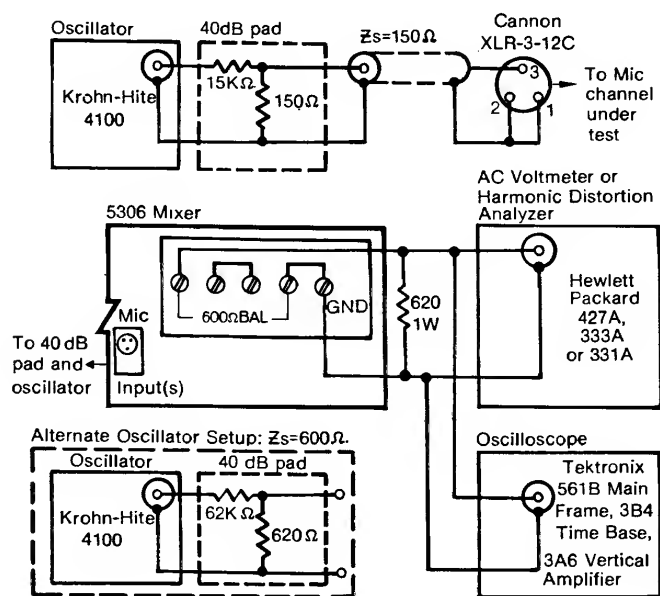
Service Notes

Performance Checks

All performance checks are in-cabinet procedures to be used for checking specifications after repair or for incoming quality control inspection. Note: All measurements should be made with the 5306 and test equipment power cords connected to a nominal 120 V AC, 50/60 Hz line voltage.

The following test equipment is recommended:

- Audio Test Oscillator—Krohn-Hite model 4100, or equivalent.
- Harmonic Distortion Analyzer—Hewlett Packard Model 333A, 331A or equivalent.
- Intermodulation Distortion Analyzer—Crown Model IMA, or equivalent.
- AC Voltmeter—Hewlett Packard Model 427A or equivalent.



Test Configuration—Frequency Response and THD

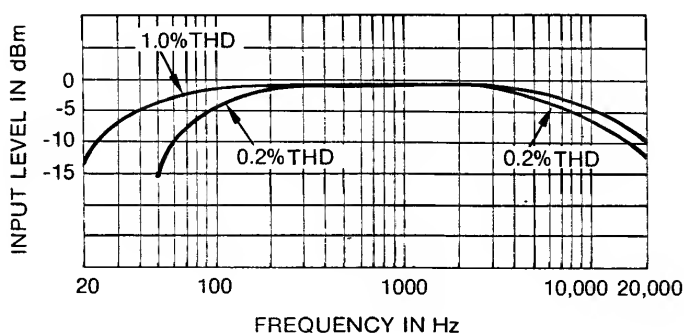
Frequency Response

1. Connect the test oscillator to any one of the six microphone inputs through a 40-dB pad with a standard microphone cable. A pad is not necessary when testing through one of the two program inputs.
2. Connect an AC Voltmeter and a 620-ohm, 1-watt load resistor across output terminals marked "600 Ω Balanced." Note that the two center terminals should be strapped.
3. With one microphone channel and Master Gain at maximum, set the test oscillator frequency to 1000 Hz and adjust its amplitude to indicate 1.95V RMS (+8 dBm) on the AC voltmeter.
4. Using 1.95V RMS as a reference level, the mixer should be within ± 1.0 dB from 20-20,000 Hz.

5. Voltage gain of the system can be checked by substituting the values in the formula $A_V (\text{dB}) = 20 \log_{10} \left(\frac{e_o}{e_{in}} \right)$
6. Input voltage to the system can be measured by connecting the AC voltmeter at the input terminal.

Total Harmonic Distortion

1. Using the test set-up illustrated, replace the AC voltmeter with the harmonic distortion analyzer at the 5306 output terminals.
2. With the microphone gain control at maximum and Master Gain at "7," set the test oscillator at any frequency between 30 Hz and 20 kHz. Adjust amplitude to indicate 6.2V RMS (+18 dBm) on the distortion analyzer.
3. Total harmonic distortion of the mixer should be less than 0.2% on any input channel.



Microphone Channel Distortion Characteristics—

Microphone input levels are as indicated for Total Harmonic Distortion levels of 1% and 0.2% at +18 dBm output with the Master Gain at "5."

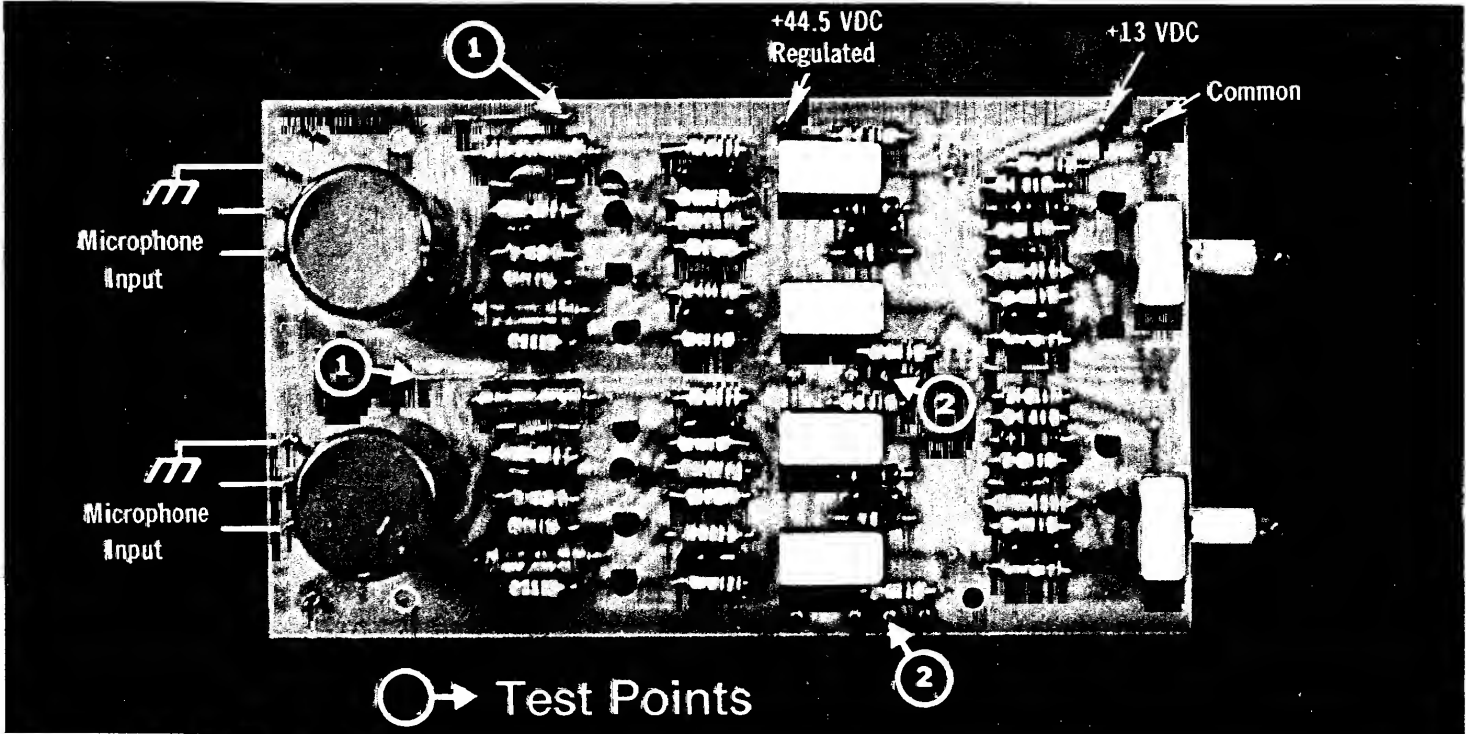
Microphone Overload Indicator

1. With the test oscillator still connected to any one of the six microphone inputs, connect the AC voltmeter across the output of the oscillator.
2. Set the microphone gain control at maximum, and the Master Gain at "O".
3. Set the test oscillator frequency to 1000 Hz and increase the amplitude until the overload indicator starts to flash. The AC voltmeter should read 40 mV nominal.

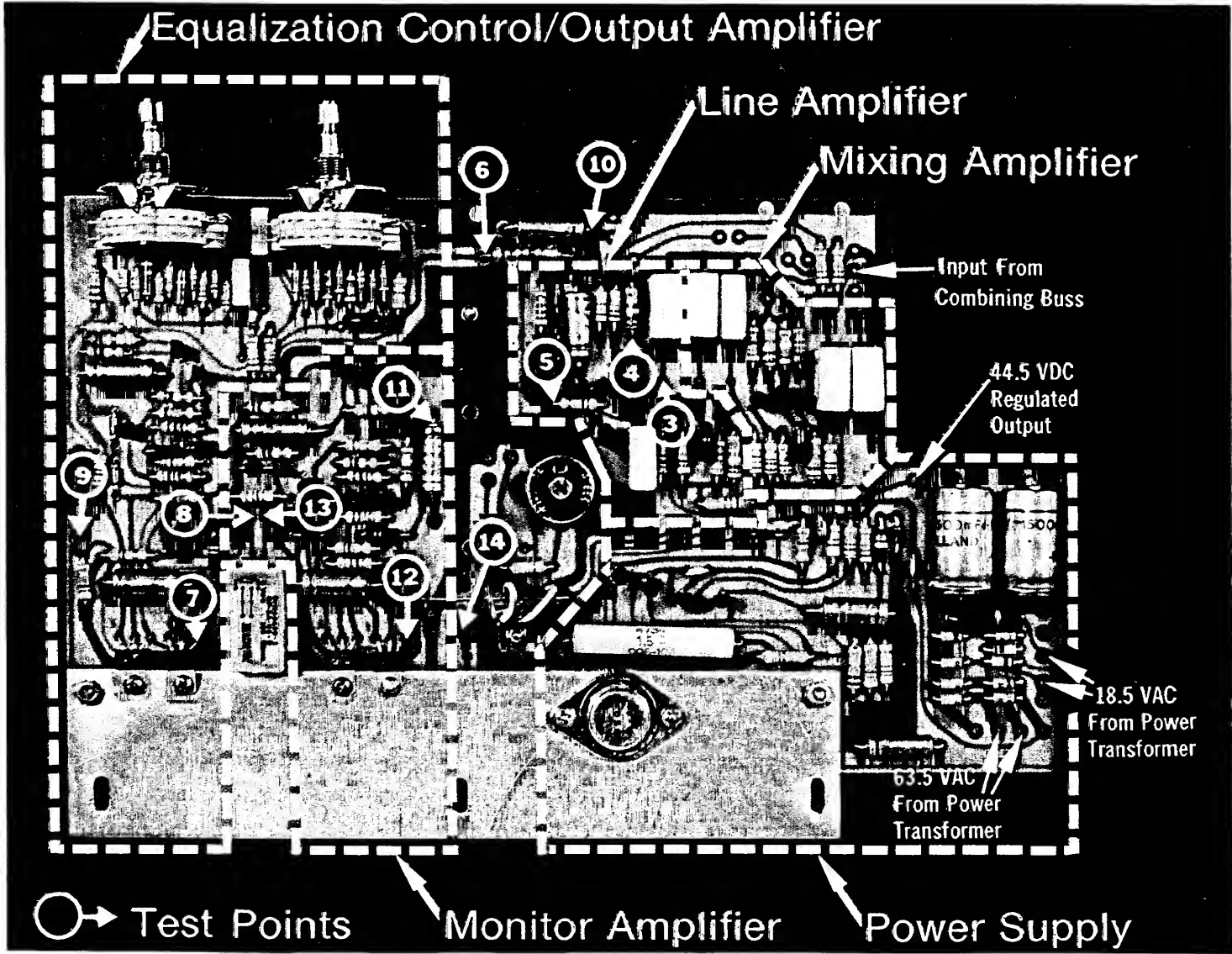
Table II, AC Test Voltages, provides the signal levels to be checked in the order indicated at various test points in the mixer. The table includes a recommended procedure if there is no signal at any one or more of the test points. The signal levels indicated in the table are based on an input signal of 1000 Hz at .5 mV applied to any one of the six microphone inputs of the 5306.

AC Test Voltages

Amplifier Stage	Gain	Test Point	Signal Level (nom)	Procedure If No Signal
Microphone Preamplifier Including Transformer	46dB Mic Control at "10"	1	$4.5\text{mV} \pm 10\%$	Check input transformer T501 or 502
		2	$.1\text{V} \pm 10\%$	Check R107 or R108, check transistor D.C. voltage (collector of Q504 or Q511)
Mixing Amplifier	17dB; Master Control at "10"	3	$.71\text{V} \pm 20\%$	Check R101; check transistor D.C. Voltage (collector of Q403); check C402.
Line Amplifier	23dB	4	$.71\text{V} \pm 20\%$	Check C406
		5	$10\text{V} \pm 20\%$	Check transistor D.C. voltage (collector of Q406 or Q407); check C408
Output Amplifier	0dB Tone Controls set at "0"	6	$10\text{V} \pm 20\%$	Check C411
		7	$10\text{V} \pm 20\%$	Check transistor D.C. voltage (collector of Q411 or Q412); check C417
		8	$10\text{V} \pm 20\%$	Check C418
		9	$10\text{V} \pm 20\%$	Check K401; check T302; check C425
Monitor Amplifier	0dB Monitor Gain Control Maximum	10	$10\text{V} \pm 20\%$	Check C419
		11	$10\text{V} \pm 20\%$	Check R102, C420
		12	$10\text{V} \pm 20\%$	Check transistor D.C. voltage (collector of Q416 or Q417); check C423
		13	$10\text{V} \pm 20\%$	Check C424
		14	$10\text{V} \pm 20\%$	Check K401



Microphone Preamplifier Assembly



Mixer Assembly

Major Parts

Schematic References Number	JBL Part Number	Description
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Transformers

T301	48400	Power Transformer
T302	47608	Output Transformer
T501, 502	47607	MIC Input Transformers

Diodes

CR401, 402, 403, 404	48343	MZ2360
406, 407, 418, 501, 502		
CR405	47611	Special
CR408-416	39869	IN4003
CR417	12864	IN4749A

Transistors

Q401, 402, 404, 405,	48338	2N5210
407, 408, 409, 413, 414,		
501, 502, 506, 507,		
508, 509, 513, 514		
Q403, 406, 410, 415,	48337	2N5086
503, 504, 505,		
510, 511, 512		
Q411, 416	48341	MPSU56
Q412, 417, 423	48342	MPSU06
Q418, 420, 421	48340	MPSA06
Q419	48339	MPSA56
Q422	48344	40636

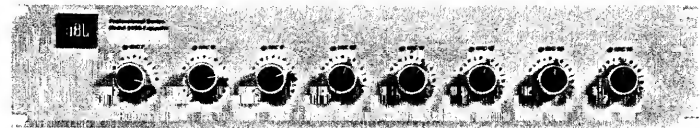
Devices

R101	47620	500K Master Gain Control
R102, 103, 104	47605	50K Monitor Program Gain Control
R105-107, 106-108	48335	25K Gain Control (2 Assys)
S401, 402	47602	Equalizer Switch
R457	47664	10K V-U Motor Adjust Pot
M101	47643	V-U Meter
K401	48383	Relay
DS101, 102	47606	Meter/Pilot Lights
DS501, 502	47604	Overload Indicator Light
S101	84733	Main Power Switch

Accessories

- 5308 Expander (8 microphone channels)
- 5192 Magnetic Phono Preamp
- 5196 Matching/Bridging Transformer

JBL Model 5308 Expander



5308 optional 8-channel expander

